nitely through the air by means of their delicate webs, the Editor sees no reason to think that the above-mentioned phenomenon was of any other nature. It does not seem possible that the burning up of meteors could in any way have produced these delicate webs.

THE BAROGRAPH ON SHIPS.

Mr. H. W. Richardson, local forecast official, Weather Bureau, at Duluth, Minn., published in the Evening Herald of January 3, 1899, an interesting account of the efforts made by the Weather Bureau to increase the safety of navigators by introducing the barograph into daily use. He says the first barograph used on the Lakes was placed by the Weather Bureau in 1892 on the steamer *J. D. Moran*. The record sheet gives practically the record of the ship's course, with the air pressure, the wind, and the state of the weather during her whole trip. The prime object of placing the barographs in the hands of navigators was to educate them in the practical use of the barometer in connection with the daily weather map.

During the present season, navigators on the Great Lakes who have used these instruments say that they have received great benefit from watching the action of the barometer.

Of the forty navigators who used the barograph during the present season, only three have said that its use was not of sufficient importance to them to be further desired.

WEIGHTS AND MEASURES IN PORTO RICO.

As there seems to be some little discrepancy between the weights and measures legalized by Spanish law and those actually in use in Porto Rico and other Spanish colonies, the Editor has collected the following recent information on this subject from the following authorities.

(1.) In a letter from Señor Antonio Mattei Lluveras, author of a recent work on Porto Rico, the following statement is made:

* * * In my letter of the 2d, from which I quote, I told you that a "cuerda," an agricultural measure of Porto Rico, represents a surface of 75 varas in length and 75 varas in breadth, or 5,625 square varas of level surface, which is equal to 39 ares, 30 centiares, and 39 miliares.

In reply to your question, "Which is the vara which is used in Porto Rico?" I would say that it is the vara of Burgos which is used, and it is equivalent to 835.905 millimeters, or 32.875 English inches.

But the Spanish Government, by the Spanish law of July 17, 1849, adopted the metric decimal system, and a few years later ordered that it be adopted in Porto Rico, and finally forbad the word "cuerda" to be used in any public document for the purchase or sale of land and established the equivalents, "Ordered, That the reduction of the cuerda to the new system be calculated at 39 ares, 30 centiares and 39 miliares." Consequently, it may be said that the cuerda is not officially used in Porto Rico, although all the Porto Ricans, in conversation and verbal contracts for the sale, purchase, or rental of land, always use the "cuerda." When, however, they go before the notary public to draw up the official written contract it is always calculated in the manner before mentioned, that is to say, each cuerda is reduced to 39 ares, 30 centiares, and 39 milliares.

From this we gather that the legal cuerda in Porto Rico is 39.339 ares, or 0.39339 hectares. The hectare is 2.471 acres, according to the Act of Congress of July 28, 1866; hence, the cuerda is 0.97212 acre.

(2.) According to a letter of February 7, from Prof. M. W. Harrington, section director at San Juan, a special investigation has, at his request, been made by Señor Don Pedro J. Fernandez with the following results:

The fundamental units are the foot or pié which measures 0.27863 metres or 10.9697 inches; the *vara-cuadrada*, 0.69872881 square metres, or 0.8356 square yards; the pound or *libra* of 460 grams, or 1.0141 avoirdupois pounds; the *galon* of 3.785166 litres, or closely the American wine gallon. The cuerda, which is the Porto Rican land measure and varies, as do all Spanish measures and weights, with the notions of the seller, is popularly put at two-fifths of a *hectairia* or hectare, that is, 0.9884 of an acre. Señor Fernandez makes it 3930.35 square metres, or 0.9704 of an acre.

(3.) A letter from Prof. H. S. Pritchett, Superintendent of the Coast and Geodetic Survey, says:

As to the value of the vara used in Porto Rico. I have to say that the metric system was made obligatory in 1888, and according to the Tables of legal equivalencies, published soon after, 1 vara equals 0.835 metre. The more precise equivalent, however, is given as 1 vara equals 0.835905 metre, and 1 metre equals 1.196308 varas. This would give 1 vara equals 32.910 inches, a value differing from both the values mentioned by you, but approximating that of Burgos much more nearly than the other.

From these figures, we find the obligatory vara to be 2.7425 feet. The corresponding cuerda is 0.971243 acre.

THE WATERSPOUT OF SEPTEMBER 29.

In the September REVIEW, page 402, Mr. Henry notes a waterspout on the Mississippi coast, September 29, at 6:50 p. m.; but a recent letter from Mr. W. T. Blythe, section director, at Vicksburg, Miss., states that it was 6:50 a. m. Mr. Blythe forwards the following full description of the spout as observed by a voluntary observer, Brother Isidore, of Bay St. Louis, Miss.:

The waterspout of September 29 occurred at 6:50 a. m. I noticed the waterspout forming about three-quarters of a mile off the coast, directly in front of the college wharf, and moving rapidly west by northwest for about five minutes. When within three hundred yards of shore it veered to a northerly direction for about three hundred yards, then rose into the air, and again veered to a westerly direction, and went inland in the form of a whirlwind. Its path could be easily followed for a mile or so by the leaves and small branches it carried up with it. While off the coast it was of no violence, having passed over several bath houses without doing any damage, but, from report and observation, as soon as it struck the mainland it increased in violence, breaking off large branches from trees and overturning three small houses in the western part of the town. No news or reports were received from the interior, so damage must have been light, or the spout may have ascended into the air.

A CRUDE HYGROMETER.

A voluntary observer, Rev. W. H. Kaufman, of Oakville, Chehalis County, Wash., sends an account of his efforts to determine the moisture in the air by means of a crude form of dew-point apparatus which may be described as follows:

A 2-quart glass fruit jar with a screw top of zinc, known as Mason's patent, is provided with a pipe supplying cold water and a waste pipe so that a continuous circulation of cold water through the jar can be maintained. A stopcock in the first pipe regulates the supply. A thermometer is also hung within the jar. In order to find the dew-point, open the stopcock and admit a flow of cold water rather slowly, so that in five or ten minutes dew will begin to gather on the outside of the glass jar. At this moment read the thermometer inside of the jar. Cold water may be admitted from the city water pipes, or failing these, from a pail of water set above the jar and connected with it by a rubber tube syphon.

The Editor would remark that this arrangement must be considered as wanting in sensitiveness and delicacy, but will certainly give results correct within three to five degrees, in case of very moist atmospheres such as occur on the coast of Washington and Oregon. But in such cases the wet bulb thermometer is more convenient. One has but to provide two thermometers, one of which is to have a bit of the thinnest muslin neatly tied around its bulb and kept soaked with water. Lift this out of the water and whirl it briskly through the air for two minutes if the air is very dry, but for three or four minutes if the air is quite moist, read it quickly and we have the so-called wet bulb temperature, which is lower than the dry bulb temperature. It gives the temperature of a thin layer of water evaporating under the influence of the

wind produced by the whirling. The dew-point of the air in which the thermometer is whirled is about as far below the temperature of the wet bulb as this is below the temperature of the dry bulb, if the latter has been similarly whirled and read rapidly. These two thermometers may be hung side by side on a short piece of string for convenience in whirling and are then called the sling psychrometer. On account of its convenience and portability, the sling psychrometer replaces the most delicate dew-point apparatus in all ordinary meteorological work. Mr. Kaufman submits the following problem:

Given the temperature of the air and of the dew-point with the height of the barometer, what does this mean in the light of our latest science? We have great trouble here in making good hay, so that this is a very practical matter.

We understand our correspondent's question to be a purely practical one. What bearing has the temperature, moisture, and pressure of the air upon practical farming operations, especially hay making? Can not some observer at a State agricultural college or experiment station answer this question?

THE WEATHER BUREAU AND THE UNIVERSITIES AND COLLEGES.

Again we have to chronicle the encouragement given by the colleges to the intellectual and educational side of the work of the Weather Bureau. Mr. D. J. Herndon, observer at Lexington, K. Y., informs the Chief of the Weather Bureau that the authorities of the Kentucky State College will furnish free office quarters and space for instrumental exposures. A well-lighted room has been placed at the disposal of the Weather Bureau. * * * The college authorities will have all necessary changes and improvements made at their own expense.

Similar arrangements are now in force at the following institutions:

Baltimore, Md.—Johns Hopkins University.
Columbia, Mo.—State University, Agricultural College.
Ithaca, N. Y.—Cornell University, engineering building.
Knoxville, Tenn.—University of Tennessee.
Lincoln, Nebr.—University of Nebraska.
New Brunswick, N. J.—State Experiment station.
Northfield, Vt.—Norwich University.

In all these cases the Weather Bureau offers a full equivalent by way of lectures and teaching, weekly crop reports, monthly meteorological returns and daily forecasts. The union of the two brings about an increased attention on the part of the students to the study of meteorology and climatology, and makes them by so much the more intelligent and better citizens. Similar intimate union between the State universities and the many scientific divisions and bureaus of the Federal Government can but lead to important advantages on both sides.

CHINOOK AT HAVRE, MONT.

Mr. C. W. Ling, observer at Havre, Mont., sends a tracing of the thermograph record for December 18–20, from which it appears that the temperature fell steadily from 45° F., on the afternoon of December 18 to about 18° F., at about 6 a. m. December 19 (seventy-fifth meridian time). After rising slowly for over half an hour, in accordance with the regular diurnal variation the temperature took a sudden jump a little before 8 a. m., and within ten minutes rose from 24° to 44°. After a half hour of this high temperature, there was an equally sudden fall to 30°, and after an hour of this temperature, a precipitous rise back to 44°, where it remained until late in the afternoon. Mr. Ling says that—

We have here two pronounced chinooks within four hours of time; the first chinook was evidently shut off for a few hours by a cold stream of air.

The Editor has often remarked upon the great variations of temperature that sometimes take place within a short period of time, during the prevalence of a chinook. It seems evident that the rapidly descending air, which is thereby warmed, is also mixed with masses of air near the ground that have not descended. Alternations of temperature of 3°, 5°, and 10°, within five minutes have been observed by himself, by Buchanan, and, doubtless others, but we know of no case where the alternation was so great as in the present instance.

NORTHERS IN THE CARIBBEAN SEA AND THE GULF OF MEXICO.

Although our West Indian service was immediately organized in view of the approaching hurricane season of 1898, yet the officials of the Weather Bureau were not unmindful of the fact that the northers in the winter season were of equal importance to the commercial shipping interests of that region. On many occasions, ever since the first predictions of November, 1871, the Editor has explained the movement of the so-called northers of Texas, and an interesting illustration of the progress of a norther over the Gulf of Mexico will be found in the MONTHLY WEATHER REVIEW for December, 1893, pages 363–364, and the accompanying Chart, No. I. Frequently the combination of a high area in the Mississippi and a low area on the Atlantic coast draws the cold air farther eastward so that it overflows a large part of Cuba. The northers of Havana have been especially studied by the officials of the Belen Observatory. We have not yet much data with regard to the progress of northers, southward over the Caribbean Sea, but the fact that severe northers occur at Colon shows that they must either proceed from high areas over the United States or else from low areas south of the Isthmus of Panama. It is to be hoped that our West Indian system will enable us to investigate this subject and predict the northers for the Isthmus of Panama as accurately as we can those for Vera Cruz, Tampico, and Havana.

RECENT EARTHQUAKES.

Sunday, August 7, at Oakland, Cal., and on Sunday, August 28, and Wednesday, August 31, at San Leandro, Cal.; both of these shocks were quite slight.

A very circumstantial account of an earthquake on Saturday morning, September 17, at Morrills Corner (described on page 415 of the September REVIEW) and North Deering, both located near Portland, Me., has been followed up by correspondence which has convinced the Editor that the whole story is a so-called fake. We can understand that political, religious, or local jealousies may suggest the publication of fakes, hoaxes, fictions, or lies, but it passes our comprehension why a respectable journal should print such matter relative to any form of natural phenomena.

Friday, October 23, at Cleveland, Ohio, three successive shocks are reported by the newspapers to have been felt during the night. Prof. E. W. Morley, of Adelbert College, Cleveland, reports several disturbances shown by the seismograph during October, caused by blasting at a point about 800 feet southwest of the instrument. Only the most powerful blasts made any record. The most vigorous movement occurred on October 29, and was probably due to some seismic disturbance. Professor Morley further reports that the seis-